

K-398

Total Pages : 3

Roll No.

MCH-503

PHYSICAL CHEMISTRY-I

M.Sc. Chemistry (MSCCH)

1st Semester Examination, 2023 (Dec.)

Time : 2 Hours]

[Max. Marks : 35

Note : This paper is of Thirty Five (35) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

SECTION–A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half (9½) marks each. Learners are required to answer any Two (02) questions only.

(2×9½=19)

1. Define the term entropy. Derive an expression for calculation of entropy change of an ideal gas when the temperature changes from T_1 to T_2 and the pressure changes to P_1 to P_2 .
2. Draw neat diagram of Carnot cycle. Explain how Carnot cycle is used to get maximum convertibility of heat into work.
3. Derive Gibbs Helmholtz equation in terms of free energy and enthalpy change at constant pressure. Bring out its importance.
4. Discuss the applications of variation method and perturbation theory to the Helium atom.
5. Describe in brief how Schrödinger wave equation is applied to hydrogen like atoms to obtain quantum numbers.

SECTION-B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only. (4×4=16)

1. Discuss the Normalized and Orthogonal wave functions.
2. Describe Cartesian and Polar Coordinates. How are they related?

3. Describe well behaved wave function. What are the conditions for a well-behaved wave function?
 4. Prove that dq/T is a perfect differential.
 5. Two moles of He are heated from 127°C to 400°C at constant volume. Its C_v is 3 cal/ mol. Calculate the change in entropy.
 6. Describe Laplacian Operator and Hamiltonian Operators and their importance.
 7. State and explain Nernst heat theorem. Discuss the third law of thermodynamics.
 8. Show that for an irreversible process $\Delta S_{\text{sys.}} + \Delta S_{\text{surr.}} > 0$.
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